HORSE MANAGEMENT

REPRODUCTION

Alberta
AGRICULTURE

agdex 460/21-1

86-03519/

Copies of this publication may be obtained from:

Print Media Branch
Alberta Agriculture
7000 - 113 Street
Edmonton, Alberta, T6H 5T6
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Alberta Agriculture's district offices

Revised 1986 02 5M

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HORSE MANAGEMENT: REPRODUCTION

by Les Burwash

Horse Industry Branch, Alberta Agriculture

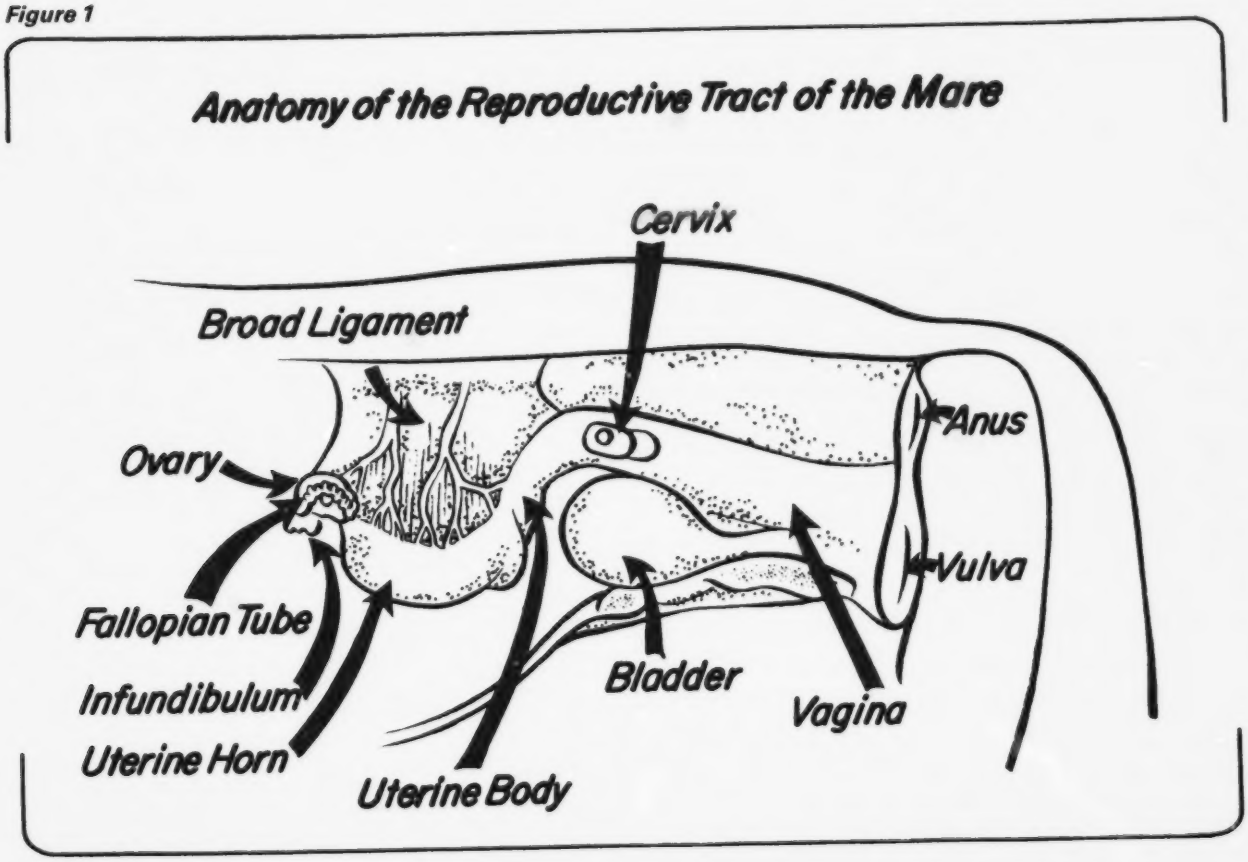
INTRODUCTION

Once the choice of mating a selected stallion to a particular mare is made, the goal is to have each mare give birth to a live healthy foal each year. Since the gestation period is approximately 340 days, this leaves only 25 to 30 days to rebreed the mare to foal within the year, (365 days). Thus, a good understanding of reproduction and management of the mare and stallion are essential.

Horses have the potential for high reproductive performance, yet many horsemen do not understand the basics well enough to exploit this potential. On many breeding farms, less than 60 per cent of the mares exposed to the stallions produce live foals.

The objective of this publication is to present information on reproduction in both the mare and stallion, and to outline some recommended breeding practices that will assist in obtaining maximum reproductive performance in the horse.

Figure 1



ANATOMY AND PHYSIOLOGY OF REPRODUCTION IN THE MARE

Basic functions of the parts of the reproductive tract:

- **Vulva** - The vulva is the external opening of the urogenital tract. It is part of the birth canal and the area where urine is voided.
- **Vagina** - The vagina lies in the pelvic girdle between the vulva and cervix. It is part of the birth canal and under natural service is the area of semen deposition.
- **Cervix** - The cervix is a structure of approximately 10 cm (4 inches) in length lying between the vagina and the uterus. It is the "door to the uterus" and attempts to maintain a stable environment in the uterus. It relaxes when the mare is in heat and closes when she is not, and when she is pregnant.
- **Uterus** - The uterus or womb consists of a large uterine body, just anterior to the cervix, and two relatively short uterine horns that terminate in the fallopian tubes. The uterus is where the major portion of embryonic development and nourishment takes place. It also serves as an endocrine gland producing hormones.
- **Fallopian Tube** - This is a long convoluted tube extending from the infundibulum to the end of the uterine horns. It serves to transport sperm and ova to the site of fertilization which occurs in the upper one-third of the fallopian tube. The fertilized ovum is then transported to the uterus.
- **Infundibulum** (fimbria) - This is at the ovarian end of the fallopian tube and comes in close contact with the ovary, especially near the time of ovulation. It picks up the ovum from the ovary at ovulation and transports it down into the fallopian tube.
- **Ovary** - This is the primary sex organ of the mare. The ovary produces the ovum (egg) to be fertilized and serves as an endocrine gland producing the hormones estrogen and progesterone.
- **Broad Ligament** - This is a tough layer of fibrous tissue, containing blood vessels and nerves, that suspends the majority of the reproductive tract in the abdomen.

NORMAL ESTROUS CYCLE

Once the mare has started to cycle normally (usually in late April or early May), she will have an estrus cycle of 21 days plus or minus 3 days. The cycle is composed of the estrus period (heat) and the diestrual period (out of heat). Estrus usually lasts for 6 or 7 days but may be 4 to 10 days in duration depending on the mare. Diestrus is normally 15 days in duration but may vary from 12 to 18 days. Mares cycle relatively consistently once they start cycling normally. If a mare is bred and conceives she tends to be in heat longer than if she does not conceive.

INFLUENCE OF SEASON

The mare is seasonally polyestrus, which means that she has multiple heat periods which tend to be concentrated in late spring and summer. This is the normal breeding season for horses. In late December, January, February and March, less than 20 per cent of the mares are ovulating. Very few mares are cycling normally at this time, thus conception is very difficult to achieve.

In April about 40 per cent of mares are ovulating which increases to 70 per cent in May and over 90 per cent in June, July and August. Since so few mares ovulate early in the year, breed associations that have January 1 as a birth date for all foals born in that calendar year are encouraging their members to handle their breeding program when the chances of success are limited. A March 1 birth date would appear to be a more suitable date.

The mares' first estruses each year are often erratic and prolonged during which time mares may be in heat for 20 to 30 days or more. Recent work by workers at Colorado State University indicates that the longer a mare remains in estrus during the transition period, the greater the chance of becoming pregnant during the prolonged estrus and in the subsequent estrus. During late March, April and May most mares begin exhibiting sexual activity, and from late April through August, most mares will cycle normally. A good rule of thumb to determine when mares are starting to cycle normally is that they have at least 4 consecutive days of estrus followed by at least 8 consecutive days of diestrus. The first day of the next estrus can be considered the first day of the first normal cycle. This will occur close to the end of April in Western Canada.

The primary environmental factor causing mares to cycle normally is increased hours of light. Artificial lighting can be used to induce mares to cycle earlier in the year. Increased environmental temperature has no influence on stimulating mares to cycle but increases in quality and quantity of feed may have some effect.

HORMONAL INFLUENCE

The estrus cycle is controlled by hormones. A hormone is a substance produced by a ductless gland and transmitted via the blood stream to another organ where a response is elicited.

The major organs of interest reproductively are the pituitary gland, the ovaries and the uterus. The pituitary gland is

located at the base of the brain and produces the hormones follicle stimulating hormone (FSH) and luteinizing hormone (LH).

As spring approaches the pituitary gland is stimulated by increased daylight to enhance FSH production. FSH is released into the blood stream and travels to the ovaries to initiate development of a follicle containing an ovum. The developing follicle produces estrogens which are released into the blood stream.

Estrogens have a number of functions in the body. When blood estrogen levels reach a certain level there is a surge of LH released from the pituitary into the blood stream. Also, estrogens in the blood act upon the brain to put the mare into the physical state of being in estrus, resulting in the external signs of estrus. Estrogens also act on the fallopian tube, uterus and cervix to prepare the reproductive tract for pregnancy.

In the early part of the breeding season when 20 to 30 day estruses are observed, probably insufficient FSH is being produced for "normal" follicular development. As well, very small follicles are often produced resulting in insufficient estrogen released to cause the LH surge but sufficient to cause the mare to exhibit the physical signs of estrus. Less than 20 per cent of these early estruses result in ovulation; thus it is impractical to breed mares during this time without rectal palpation of the ovaries to determine follicular development.

The increased estrogen level stimulates an LH surge which causes the follicle on the ovary to rupture and ovulation is the result. As the follicle develops on the ovary, the ovum (egg) inside the follicle undergoes a number of changes to become capable of being fertilized by the sperm. The follicle contains a viscous fluid and when the follicular wall ruptures this fluid flows out carrying the ovum with it. The cavity left by the ruptured follicle becomes engorged with blood to form a corpus hemorrhagicum (CH). The CH luteinizes to form the corpus luteum (CL), sometimes called the yellow body.

As the CL develops, it starts to produce progesterone which influences the pituitary and reproductive tract. The feedback of progesterone via the blood stream inhibits the release of FSH and LH and causes the mare to stop showing estrus. The latter is due in part to the fact that estrogen levels are decreasing. Progesterone activity on the reproductive tract is also very important in that the uterus changes from a fairly active motile organ to a quiescent, stable organ. Progesterone function is to maintain the pregnancy by maintaining a uterine environment conducive to fetal development.

If the mare does not conceive the CL remains functional for about 12 to 14 days. At this time, another hormone released from the endometrium (inner lining of the uterus), Prostaglandin $F_2\alpha$ ($PGF_2\alpha$), is carried to the CL via the blood causing the CL to regress (luteolytic activity). As the CL regresses the progesterone production decreases, thus blood progesterone levels are reduced, resulting in the removal of the inhibition of FSH and LH production and secretion. The cycle starts over again. (Figure 2)

If the mare conceived during estrus the hormonal activities are essentially the same up to approximately 12 to 14 days post ovulation. The developing embryo migrates throughout the uterus. This action stimulates pregnancy recognition. The result is an antiluteolytic effect that inhibits $PGF_2\alpha$ release. The CL remains functional, progesterone levels are maintained and the pregnancy is continued.

Somewhere between day 25 and 30 of gestation the primary CL (CL formed from the ovulation resulting in the pregnancy) starts to regress resulting in declining blood progesterone levels. If the progesterone level was to continue decreasing the pregnancy would be terminated, thus a compensatory system has evolved that is unique to the mare. Between the 25th and 36th day of gestation a girdle-like band of special cells develops around the fetal sac. On about day 37 of gestation this band detaches from the fetal membranes and invades the endometrial (uterine) wall where these cells undergo tremendous enlargement and structural change. These cells clump to form the endometrial cups which produce the hormone pregnant mare serum gonadotrophin (PMSG). PMSG reaches the ovaries via the blood stream stimulating secondary follicular development and luteinization. The secondary CL's produce progesterone as does the primary CL to day 130 to 150 of gestation. From about day 80 of pregnancy to term, adequate progesterone levels are maintained by special areas of the uterus and/or fetal membranes to sustain the pregnancy.

From day 45 to about day 120 a serological test for pregnancy is available which detects the presence of PMSG in the blood. The test does not guarantee that the mare is pregnant but does indicate if the mare was pregnant up to day 37 of gestation. It is advisable to have the mare checked for pregnancy by a veterinarian approximately 40 and 120 days post breeding. This will confirm the serological test and/or the ultrasound results, so management of the mare will be dependent on the pregnancy exam.

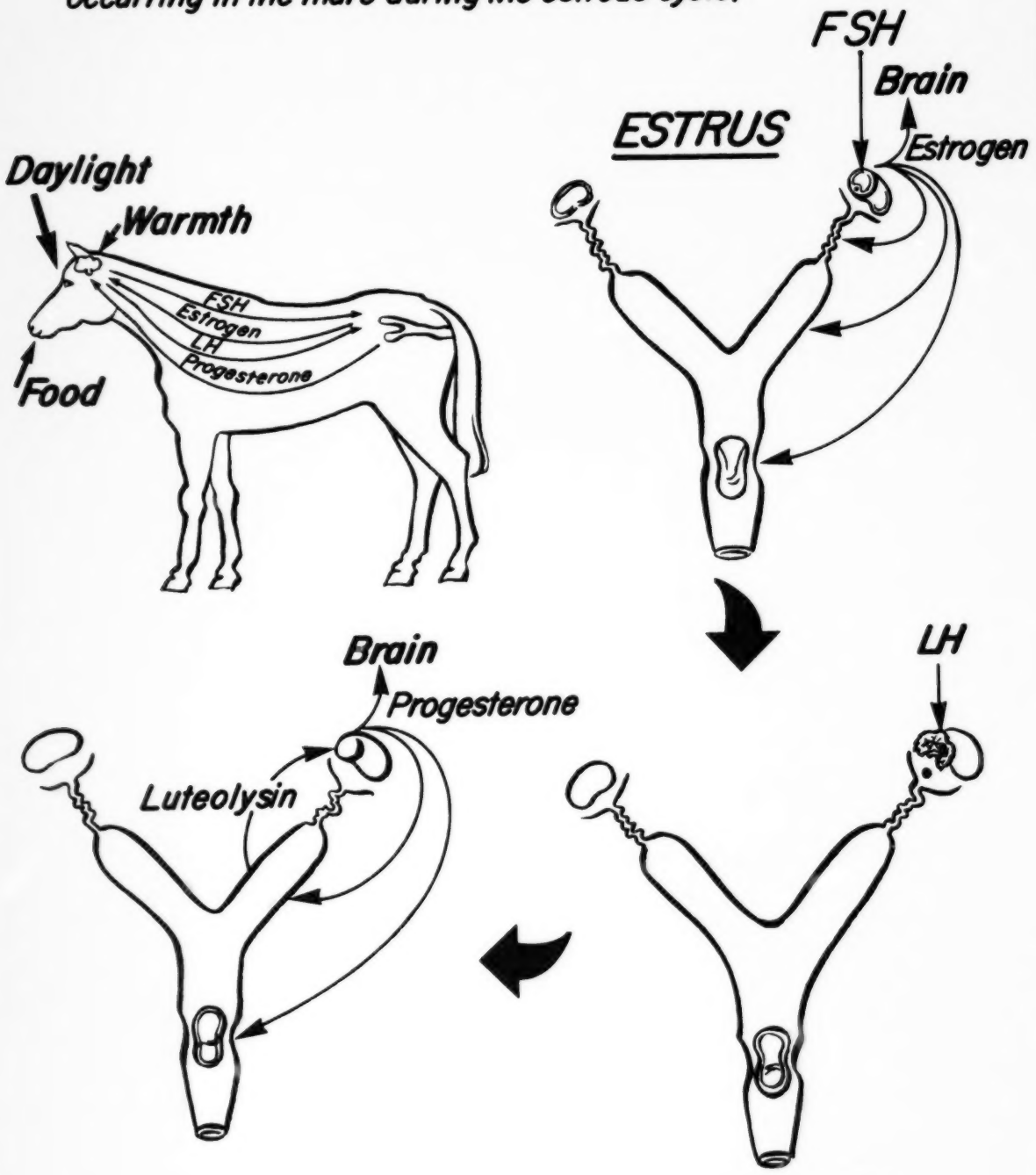
The pregnant mare foals (parturition) 340 + 20 days post breeding. Initiation of parturition is very complex and not completely understood. Mechanical stimuli occur from distension of the uterus which brings about an increased sensitivity of the uterus to the hormones, estrogen and oxytocin. At the end of pregnancy the uterus becomes active and the cervix dilates. Oxytocin, a hormone from the pituitary, is released which causes the muscles of the uterus to contract and expel the fetus (foal). The fetus probably plays a role in initiating parturition as well.

MODIFYING CYCLIC PATTERNS

The use of exogenous hormones to modify the normal cycle and seasonality of the mare has shown to be a useful management tool. The use of the oral progestin altrenogest is an effective regulator of estrus and ovulation in the late transition period. The use of altrenogest, in conjunction with an artificial photoperiod, is effective in establishing normal cycles earlier in the year. Using

Figure 2

Diagrammatic representation of the principal hormonal changes occurring in the mare during the estrous cycle.



(ALLEN 1972)

altrenogest on mares that have not been in heat for over 10 days or if their ovaries do not have one or more follicles of 20 mm, has not proven successful in the early transition period. Feeding 0.044 mg per kg of body weight of altrenogest for 15 consecutive days is effective, whether in conjunction with artificial photoperiod or late in the transition period. (Squires et al 1983). On the average, one can expect mares to return to estrus in 3.5 days post treatment and have a normal length estrus (6-7 days) with normal fertility.

Altering the cyclic patterns once mares have established set patterns can be accomplished using progestins, prostaglandins or human chorionic gonadotrophins.

The use of progestins or prostaglandin ($F_2\alpha$ or analogues) is most effective in regulating when mares will come into estrus. Feeding altrenogest at a rate of 0.044 mg per kg of body weight will suppress estrus behavior within 3 days. The interval post treatment to estrus is approximately 4.5 days. Prostaglandin $F_2\alpha$ is the luteolysin released from the uterus to cause the CL to regress if the mare is not bred or pregnant on about day 12 of diestrus. This same product or its synthetic analogues can be used to shorten the diestrus period and enhance the onset of estrus. Prostaglandins are only effective when used after the fifth day post ovulation (4th day of diestrus). Mares will come into estrus in 3 to 5 days following treatment and remain in estrus a normal length of time.

The use of the altrenogest and the prostaglandins does not enhance or impede fertility.

Human Chorionic Gonadotrophin (HCG) has primarily LH activity. The administration of 3000 IU on day 2 or day 3 of estrus will shorten the estrus period two to three days. There is no increase in fertility.

Breeders should note that the use of hormones to alter cyclic patterns is only a tool to be utilized with sound management practices. They should not be viewed as a panacea for all reproductive problems.

FERTILIZATION

The site of semen deposition in the mare is in the vagina (natural breeding) or the uterine body (artificial insemination). Actual time for sperm to move from the point of deposition to the area of fertilization has not been determined; this area being the upper one-third of the fallopian tube. The muscular movements of the uterus and fallopian tubes under the influence of estrogens are responsible for the rapid migration of sperm.

The follicle ruptures releasing the ovum to be picked up by the fimbria (infundibulum). The fimbria funnels the ovum into the fallopian tube, where it comes in contact with the sperm. The union of the sperm and ovum forms the zygote or the beginning of an embryo. The embryo moves down the fallopian tube to the uterus. The time required to move the embryo from the site of fertilization into the uterus is about six days. By this time the uterus has been under the influence of ovarian progesterone so as to create a suitable environment for fetal development and implantation.

Recent studies by Ginther have shown that the conceptus is relatively mobile within the uterus. Mobility ceases on day 16 to 17 post ovulation because of the increased uterine tone, thickening of the uterine wall and enlargement of the vesicle. Movement throughout the uterus plays a physiologic or metabolic role in the inhibition of the mare recycling and/or is a biological embryo-reduction mechanism to reduce twinning.

Implantation is not complete in the mare until as late as 50 or more days post breeding. Up to this time the fetal sac lies unattached in the lumen of the uterus and is held in place only by the increased tone of the uterine muscles. Formation of the endometrial cups should not be confused with implantation.

The endometrial cups are made up of fetal cells, thus they are composed of one-half the genetic material from the stallion and one-half from the mare. The mare's immune system recognizes them as foreign protein and sets out to destroy the foreign material (immune response). The mare's immune system takes approximately 90 days to completely eliminate the endometrial cups. The endometrial cups produce PMSG for that period of time. If a mare remains pregnant past day 37, and aborts prior to day 120, then she should not come back into estrus until about day 120 - 140. It is not advisable to treat an aborted mare with hormones to induce estrus as the uterus will not be ready to accept the embryo.

EMBRYONIC AND FETAL DEVELOPMENT

The development of the embryo is as follows:

24 hours	- 2 cells
30 - 36 hours	- 4 cells
90 - 144 hours	- Enters the uterus
98 - 100 hours	- 16 cells
124 hours	- Blastocyst - the developing embryo is a fluid filled ball of cells
6 - 15 days	- Embryonic vesicle moves throughout the uterus
16 - 17 days	- Embryonic vesicle becomes at a fixed location
30 days	- C/R length 0.1 cm and weighs 0.2 g
35 days	- Most organs present in rudimentary form
	- Fetal circulatory system present
60 days	- C/R length 7 cm and 20 g
	- Nostrils, lips and feet developing
90 days	- Hooves are present
115 days	- Fetus weight about 0.8 per cent of birth weight or 0.36 kg
120 days	- C/R length 20 cm and 1 kg
	- Fine hair starts
180 days	- C/R length 60 cm and 5 kg
230 days	- Fetal weight is about 24 per cent of birthweight or 12.8 kg

240 days	- C/R length 80 cm and 15 kg
	- Mane and tail hair
270 days	- Fine hair over entire body
300 days	- C/R length 120 cm and 37 kg
	- Complete
340 days	- Foaling
	- C/R length 150 cm and 54 kg

*C/R - Crown to Rump length

The fetus gains about 25 per cent of its weight during the first two-thirds of gestation and 75 per cent of its weight during the last one-third of gestation; thus extra nutrients for the pregnant mare become important during the last one-third of gestation.

From approximately day 100 of gestation onwards, high levels of estrogens are found in the mare's urine which are useful to the drug industry. The collection of urine from pregnant mares (PMU) is an important livestock industry in many parts of Canada. The estrogens are used in human medicine and cosmetics.

PREGNANCY CHECKS

Once a mare has been bred, it is advisable to have her pregnancy checked. If a mare shows no signs of heat for 20 days after breeding, she has approximately a 90 per cent chance of being pregnant. A veterinarian is capable of diagnosing pregnancy as early as 15 days post ovulation using an ultrasound machine. From day 30 to 35 of gestation, and later, a veterinarian can diagnose pregnancy by rectal palpation. The immunological blood test for pregnancy can be carried out between day 40 and 120 of gestation. Tests for the presence of estrogens in the urine from day 120 of pregnancy can also be used. It is advisable to have mares pregnancy checked by a veterinarian between 30 and 35 days post breeding and then between 100 and 120 days. Adjustments in mare management are done at these times based on pregnancy status and body condition.

FOALING

The foaling period is the culmination of a year's work for the horse breeder, and mare. If live, healthy foals are not delivered from pregnant mares, the efforts of the entire year have been for nothing. Good management is the key to a successful foaling season. Proper facilities, knowledge of the mare and foal are the essential prerequisites of the successful manager.

FACILITY

The choice of whether to foal inside or out is an individual one and depends on many variables such as number of mares, space, housing, labor, weather, etc. The critical point is that the area chosen for foaling be clean and free of contamination.

When the weather is warm and a large, clean, uncrowded pasture is available, outdoor foaling is recommended. Frequent observation of both mare and foal is essential, and thus it is necessary that the pasture be close to buildings (with telephone) and be easily accessible in case problems arise and a veterinarian has to be called.

If foaling is to be done inside, it is necessary to have a large, comfortable, quiet, well-ventilated, well-lighted and **CLEAN** box stall for the purpose. A lye solution can be used to thoroughly clean the stall before adding fresh bedding to it. It is advisable to be able to observe the stall while remaining out of view of the mare when foaling is taking place. Unnecessary human presence at the time of foaling can cause abnormal behavior in the mare (e.g. foaling while standing). At the first signs of approaching parturition the mare can be moved into the foaling stall and kept there, at least during the nights, until she foals. This will give her an opportunity to adjust to the new surroundings prior to foaling and will insure that the mare will be in the proper place if she decides to foal earlier than the signs indicate.

THE MARE

The average length of gestation in the mare is 340 days but can vary within 20 days on either side of the average. Mares will almost invariably foal at night. Usually the first sign of approaching parturition (foaling) will be distension of the udder; this can occur anywhere from 10 days to a month or more before the actual foaling date. The teats usually do not distend to the very tips until within a week prior to parturition. Approximately a week before foaling the abdomen will sag and the muscles around the tail head will appear to shrink and distend. The vulva will become enlarged and loose and a waxy secretion forms on the teats within two to four days of parturition. This latter sign is unreliable in that many mares do not "wax up" at all.

Next the mare will become irritable with other horses and will stand off by herself. Soon she will become restless and uneasy; she may take frequent small mouthfuls of feed, begin to sweat, urinate frequently, lie down frequently and look at her flanks. She is now in the first stage of labor.

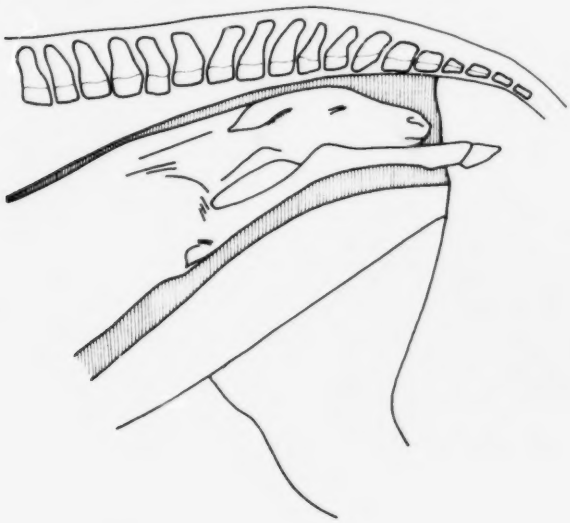
Next the 'water bag' will rupture as it enters the cervix; this causes amniotic fluid to flow like urine from the vulva lubricating the birth canal. Shortly after this point the front feet of the foal should appear at the vulva. If this is delayed past 30 minutes or if the presentation is not normal (Figure 3) veterinary assistance should be sought immediately. Mares will foal quickly (15 minutes) and unaided in a vast majority of cases; however, when trouble is encountered it is very acute because the violent straining of the mare can damage her and her foal. If a problem that cannot be easily corrected is recognized soon after rupture of the water bag, the mare can be forced to her feet and walked around to prevent excessive straining until a veterinarian arrives.

Veterinary assistance should be sought if the afterbirth (placenta) is not expelled within six hours after foaling. Severe infection resulting in laminitis can occur if the

mare does not clean properly. It is a good idea to tie the placenta into a ball to prevent it from flapping against the mare's legs or getting stepped on by the foal; also the weight of the ball will aid in expulsion of the membranes. Do not pull the placenta free.

It is important that the mare receive daily exercise both before and after foaling. Just prior to foaling the diet of the mare should be supplemented with a laxative such as bran. This will be continued for about a week after parturition along with a reduced amount of grain and small quantities of water given frequently. Close observation of the mare for fever, vaginal discharge or lameness is imperative in the post parturient period.

Figure 3



Normal Presentation of the Foal

THE FOAL

The newborn foal is very susceptible to the harmful influences of his new environment. Immediately after delivery the foal should be checked to make sure his nostrils are not blocked by membranes and that breathing can take place. If the mare is still too weak or does not attempt to lick the foal it is a good idea to rub the foal vigorously with dry towels to dry it off and promote circulation. The umbilical cord should not be severed but should be allowed to break on its own. A good portion of the foal's blood is contained in the cord and placenta at birth. If the cord is broken before it has constricted and forces this blood into the body, the foal will be weaker due to reduced blood volume.

Soon after birth when the cord has broken, the foal's navel should be dipped in a five per cent tincture of iodine solution to help prevent infectious agents from entering the body through the umbilicus. Navel infection is a very common and serious affliction of newborn foals. Affected foals often die and those which live are commonly useless due to settling of the infection in their joints, "Navel Ill". Some authors advocate treating all newborn foals with antibiotics for prevention of possible infection; this may be a sound practice, but if the foal appears healthy and proper sanitation procedures are followed prior to and during parturition, it probably is unnecessary.

It is essential that foals ingest colostrum (first milk). The colostrum contains maternally produced antibodies which protect the foal against many environmental contaminants until the foals' own immune system has matured enough to take over this function (at approximately 8 weeks of age). If for any reason the foal is unable to suck, the colostrum should be milked out and the foal hand fed.

There is only one instance in which the foal **Should Not** be allowed to ingest its mother's colostrum. In cases where the mare and foal have different blood types, it is possible for the mare to develop antibodies against the foal's red blood cells. These antibodies will be present in the colostrum. If the foal ingests the colostrum within 36 hours of birth the antibodies are absorbed (after 36 hours they are not absorbed) into its blood stream where they attack and destroy the foal's red blood cells. The condition is called neonatal isoerythrolysis or jaundiced foals and occurs in less than 1 per cent of foals. There is a relatively simple procedure for testing the compatibility of the colostrum with the foal's blood that can be done by a veterinarian or by the stable manager himself, once a degree of proficiency has been obtained. Foals that are found to cross-react can be muzzled for the first couple of days and the colostrum milked out. This should be done on all known sensitized mares and if blood types are known, mate the mare to a stallion that is of the same blood type. It is an excellent idea to milk out and freeze the colostrum from any mare that loses her foal or cross-reacts with her foal. After proper cross-matching with the recipient foal's blood, this frozen colostrum can then be fed to orphaned foals or other foals that cross-react with their natural mother's colostrum.

Orphaned foals, or foals from dry mares can be given a cow's milk formula after the initial two days of donor colostrum feeding. This formula should contain low butterfat cow's milk sweetened with sugar or syrup (1 tablespoon per pint of milk) and containing three to five tablespoons of lime water per pint. Initially this mixture should be fed at a rate of 0.25 pint per hour. The sugar and lime water can be constantly decreased until the foal is receiving straight milk at five weeks. A commercial milk substitute (Foal-Lac) for foals is available through veterinarians. This product produces good results if used as recommended. Creep feeding should be encouraged as early as possible. Use a high quality commercial foal ration.

It is important that the foal has a bowel movement within the first twelve hours of life. If no bowel movement is noticed and/or the foal begins showing signs of constipation (tail switching, straining) warm, soapy water

or glycerin enemas should be given immediately. Castor or mineral oil can also be given by a veterinarian or the stable manager proficient in the use of a stomach tube.

Diarrhea will often affect foals for three to five days when the mare enters her foal heat. This is not usually serious. A foal with diarrhea should be carefully watched, however, to make sure the diarrhea is not from other causes. If the foal shows signs of abdominal pain, temperature rise, dehydration or abnormal behavior a veterinarian should be called immediately.

REASONS FOR INFERTILITY

GENITAL CONFORMATION

The lips of the vulva should be vertical and closed. Sinking of the anus tends to tip the vulva and opens the lips slightly (wind sucker) allowing vaginal contamination resulting in poor fertility. The correction of this is a Caslicks operation which consists of partial suturing of the lips of the vulva together, allowing room for urination.

DISEASES

Pseudomonas, B-hemolytic streptococci, Staphlococcus and Klebsiella are venereal diseases of primary importance. Fertility is reduced by these organisms but more research is required to determine their roles, importance and control. Contact your veterinarian if you suspect a disease problem.

ANOMALIES OF THE REPRODUCTIVE TRACT

Cervical adhesions or closures, uterine cysts, scar tissue, blocked or adhered fallopian tubes, cystic ovaries or other anatomical abnormalities may cause reduced fertility or sterility.

MANAGEMENT

Mares are not inherently less fertile than other domestic animals, although management often makes it appear that way. Mares that are too thin or over-fat have reduced fertility. It is advisable to have mares gaining weight prior to and during the breeding season. Mares must be teased (exposed to a stallion) daily to determine their estrual cycles.

The veterinary examination of mares with reproductive problems should be done well in advance of the breeding season (October to December) so that problems can be corrected prior to breeding.

ABORTIONS

EMBRYONIC LOSSES

As in the case with most domestic animals, the greatest incidence of fetal loss occurs early in gestation. Table 1 shows the incidence of embryonic loss at different stages in early gestation.

Table 1 — Embryonic Loss During Early Pregnancy

Days of Gestation	Number Mares & Ponies	% Loss
11 - 15	100	19
15 - 20	77	2.6
20 - 25	74	4.1
25 - 40	178	0.5

Ginther 1985

VIRAL CAUSES

Rhinopneumonitis virus normally associated with an upper respiratory disease does cause mares to abort. The abortions often follow, by several weeks, or months, an outbreak of the respiratory form of the disease in young animals. Abortion usually occurs after the eighth month of gestation. Infected foals may be born alive but die within minutes to four days. Fertility of subsequent estruses do not appear to be affected unless there is a secondary infection. Mares can be vaccinated to reduce the incidence of the disease but this should be done prior to the seventh month of gestation or following vaccine manufacturer's recommendations.

Other viral diseases, equine arteritis and equine infectious anemia, have been demonstrated to cause abortion but their incidence in Alberta is very low.

BACTERIAL CAUSES

Salmonella abortus equi causes abortions but the incidence is very low.

Streptococcus genitalium is the most common cause of genital infections in horses and is found everywhere on the external genitalia of mares and stallions and can be cultured from the genital tract of most mares for a few days post-foaling. This infection is most common in windsucking mares and is associated with cervicitis, metritis and vaginitis. Under well managed, sanitary conditions few problems are encountered in normal healthy mares.

Leptospira pomona, Staphylococci, Corynebacterium equi, Klebsiella pneumoniae var. genitalium and *Pseudomonas aeruginosa* have been diagnosed as abortive agents.

BREEDING ON FOAL HEAT

Mares come into estrus about nine days after foaling. Breeding on foal heat increases the abortion rate significantly so it is advisable to bypass the foal heat breeding and breed the mare on her second heat after foaling. If a mare is checked by a veterinarian at foal heat and the uterus is involuting normally and there are no signs of infection or trauma then breeding on foal heat can often be used successfully. Some mares that are not bred on foal heat may not show further signs of estrus while lactating.

OTHER ABORTION CAUSES

Twins

Twinning is a common cause of abortions in mares because there is insufficient uterine and placental area to nourish two fetuses.

The incidence of double ovulation in the mare is approximately 25 per cent yet the incidence of twins being born is less than 1 per cent. The mare has a biological means of reducing the twin conceptions to a single foal pregnancy in most cases. Research indicates that manual manipulation to eliminate one conceptus of a twin in the mare is no more successful than leaving the mare to eliminate one on her own. Avoiding breeding when double ovulations appear imminent is not advised because a higher pregnancy rate is obtained then than waiting for one of the follicles to ovulate.

If twins are suspected it is not recommended that one alter normal management practices until the mare is diagnosed to be carrying twins at 30 days. At this time, if one is going to intervene, aborting the mare with prostaglandin and starting over is probably the best alternative. Non-intervention is the other alternative, to let the mare eliminate one conceptus on her own. There is a need for much more research on the managing of twin pregnancies.

Umbilical Cord Torsion

Umbilical cord torsion is the cause of about one per cent of late abortions. The cord becomes excessively twisted causing a closure of the umbilical blood vessels.

Fetal Abnormalities

Genetic abnormalities are diagnosed as a cause of a small percentage of abortions. This is nature's way of eliminating some inferior individuals. If better detection methods were available, it might be found that the incidence of genetic defects might be the most significant cause of abortion.

Nutritional Deficiencies

A vitamin A deficiency can cause abortion. Most other nutrient deficiencies have to be extremely severe to cause abortion as once conceived the foal has priority over the mare's body for most nutrients. Small, weak or stillborn foals are commonly the result of nutrient deficiencies.

Trauma

Pregnancy checks, if done by experienced personnel, do not cause abortions. When breeding or treating mares that have been bred previously do not force anything through the closed cervix. The mare may be pregnant and abortion will probably result. Excessive stress during the last couple of months of gestation should be avoided.

For all aborted fetuses a veterinarian should be called or the fetus sent to a diagnostic lab for determining the probable cause.

PREGNANCY MAINTENANCE

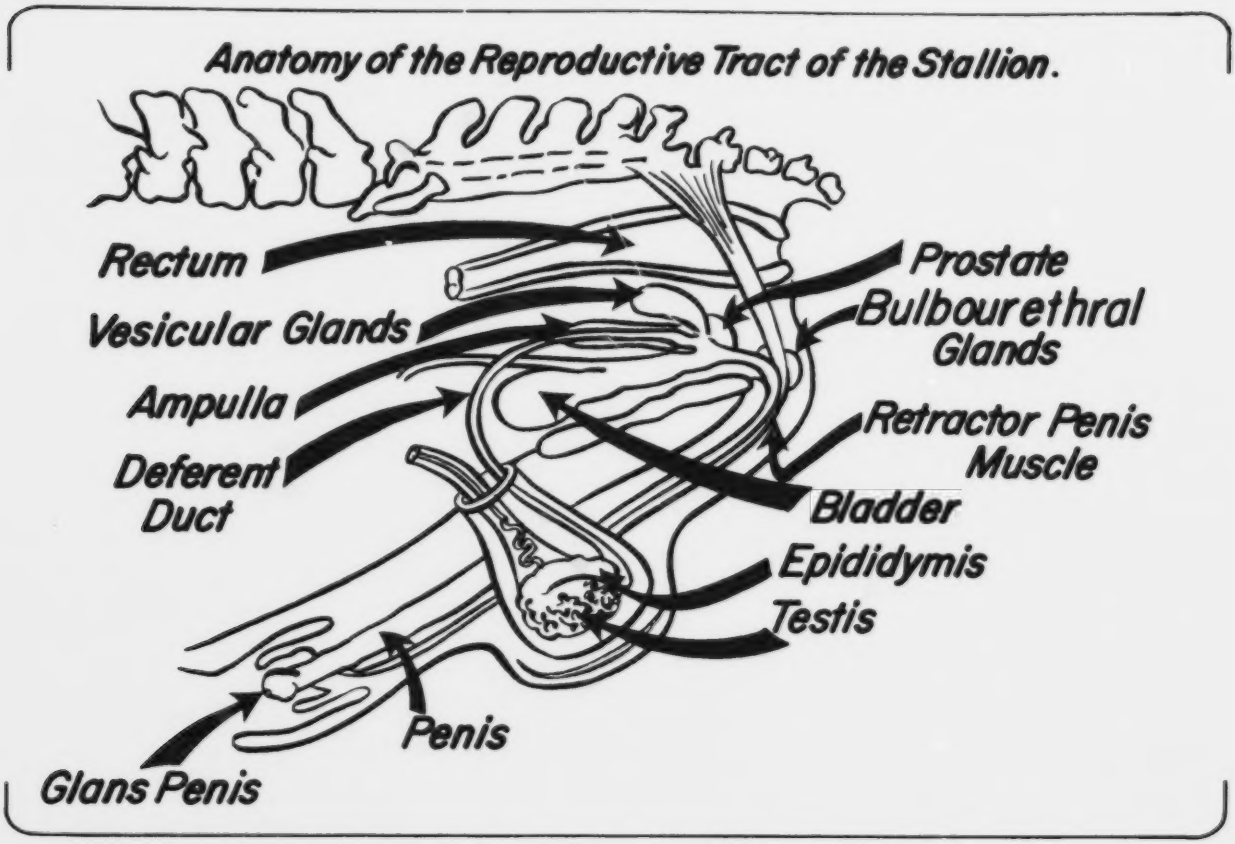
Some mares have a tendency to abort early in pregnancy owing to inadequate luteal function resulting in a deficiency of progesterone. It has been shown that mares should maintain a mean blood progesterone level of 4 mg/mL. For habitually aborting mares, pregnancy may be maintained by feeding altrenogest at a rate of 22 mg daily. The maintenance of pregnancy does not require a function CL beyond about day 100 of gestation, as adequate sources of progesterone from the feto-placental unit will maintain the pregnancy.

ANATOMY AND PHYSIOLOGY OF REPRODUCTION IN THE STALLION

ANATOMY OF THE REPRODUCTIVE TRACT

Figure 4 shows the anatomy of the stallion's reproductive tract.

Figure 4



- **Testis** - The testes are paired and produce spermatozoa and the male sex hormone, testosterone.
- **Epididymis** - The epididymis transports sperm from the testis to the deferent duct, and is the area for sperm maturation and storage.
- **Deferent Duct** - The deferent ducts transport sperm from the epididymis to the area of the accessory sex glands.
- **Vesicular Glands** - The vesicular glands are accessory sex glands and add the gel fraction to the ejaculate.
- **Bulbourethral, Vesicular and Prostate Glands** - These are accessory sex glands which add fluids to the ejaculate.
- **Penis** - The penis is the male sex organ, composed primarily of erectile tissue. The urethra, a tube the length of the penis, conducts urine and semen to the outside.
- **Glans Penis** - This is the sensitive end of the penis that enlarges during copulation.
- **Retractor Penis Muscle** - This muscle retains the placid penis in the sheath and relaxes during erection.

SEASONAL INFLUENCE ON STALLIONS

As in the mare, reproductive performance of the stallion is affected by the season of the year. In a study conducted at Colorado State University, five mature stallions were put on a collection schedule that spanned 13 months.

Two ejaculates were collected weekly approximately one hour apart. Greater seminal volume is produced in the spring and summer than in winter. The average volume of seminal plasma is approximately 65 mL but may vary from 5 to 100 mL. Sexual stimulation will increase seminal plasma volume but not sperm output. Of more importance to the stallion owner is sperm production. During the winter months sperm production is approximately one-half that of spring and summer. Thus, in theory, one could breed one-half as many mares in January as in June. Sperm motility is not influenced by the season of the year.

The Colorado researchers have also studied sperm production and output. Sperm production is related to testicular size in that one gram of testicular tissue produces approximately 16 million (16×10^6) sperm cells per day during the breeding season. During the summer months the average mature stallion will produce approximately 8 billion sperm cells per day. The normal stallion has extra gonadal sperm reserves of approximately eight days production.

Total scrotal width will vary with season showing a 17 per cent decrease from July to November. This accounts for part of the seasonal influence on sperm output.

Age of the stallion influences sperm output by changes in the size and integrity of the testicular tissue. Total scrotal width increases until the stallion is at least six years of age. This will remain relatively constant until testicular degeneration takes place with age. The time frame regarding this varies with the individual. Spermatozoal storage capacity is considerably larger in the mature stallion than in the two or three year old. As a general rule, the mature stallion produces in excess of twice the number of spermatozoa per day as a two or three year old stallion. Thus, the two and three year old stallion cannot be used as frequently as the mature stallion without reducing fertility. Age does not influence semen quality in normal stallions.

The number of times a stallion can be used in a given period of time is influenced by (a) sperm output, (b) age, (c) semen quality, and (d) desire to breed. Recent studies by the Colorado workers and Saskatoon workers indicate that desire to breed may be the limiting factor in mature normal stallions. Using normal stallions to breed mares two or three times per day is not excessive.

The seasonal influence that most stallion owners see is a difference in sexual response. Figure 5 shows the reaction time of stallions as influenced by season. During the

Figure 5

THE EFFECT OF SEASON ON SEXUAL BEHAVIOR AS MEASURED BY REACTION TIME.

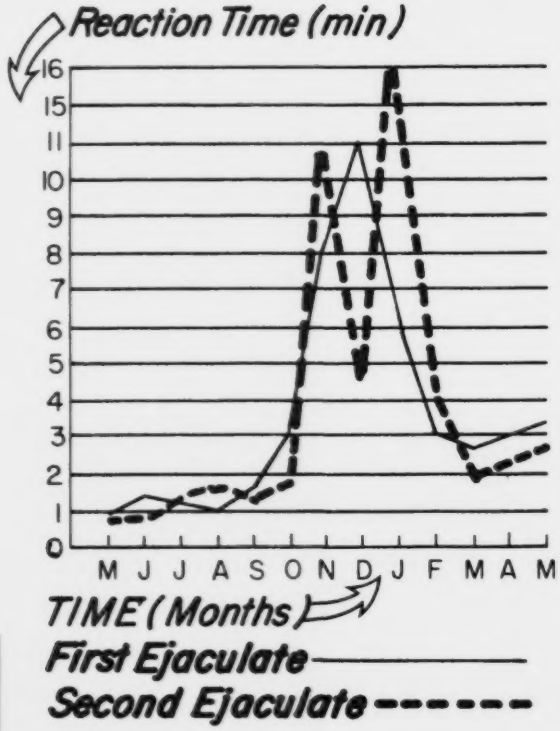
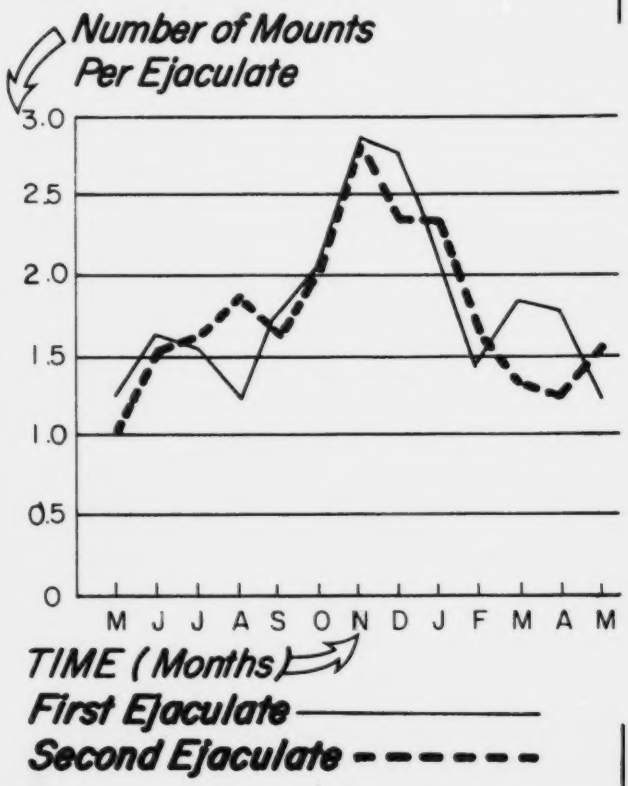


Figure 6

NUMBER OF MOUNTS REQUIRED PER EJACULATION BY MONTH.



(PICKETT AND VOSS 1972)

breeding season (April, May, June, July and August) it took less than two minutes for the stallions to become sexually stimulated, mount and enter the artificial vagina. In the wintertime the reaction time was in excess of 10 minutes. This also plays a role when training the young stallion to breed, therefore it is most desirable to commence in the normal breeding season.

The seasonal influence on ability to ejaculate is shown in Figure 6. In the normal breeding season just over one mount per ejaculate was required but in the non-breeding season there were in excess of 2.5 mounts per ejaculate required. In handling stallions, just because the stallion mounts and copulates, it does not mean that he ejaculates.

STALLION INFERTILITY

HEMOSPERMIA

Hemospermia means blood in the semen, which renders the spermatozoa infertile. Call your veterinarian if you see indications of blood on the front of the back legs, dripping from the penis or in the semen.

DISEASES

Klebsiella and B-hemolytic streptococci are organisms associated with infertility. Infected stallions tend to shed these organisms intermittently and mares tend not to conceive while the organisms are being shed. Apparently they are harbored in the prepuce area. Positive diagnosis can be determined from a semen culture and/or a urethral and prepuce swab following ejaculation. Although the infected stallion may spontaneously rid himself of the organisms, to date treatment of infected stallions consists of treating semen with antibiotics and cleansing the prepuce and irrigating the area and the urethra with glycerine and the appropriate antibiotic. The use of artificial insemination is the only way in which effective treatment of semen with antibiotics is possible.

OVERUSE

Stallions can be temporarily infertile or subfertile when subjected to overuse. Use depends on the individual stallion's sperm production, viability, and desire to breed. Some stallions can be used two to three times a day with no apparent problems where once a day is too heavy use for another. It is best to have a potential fertility examination done on all stallions prior to the breeding season to determine individual schedules of use and number of mares to book to each stallion. The limiting factor as to number of mares a normal mature stallion can breed is libido or desire to breed.

ILLNESS

If a stallion becomes ill or an injury occurs causing testicular temperature to become elevated, damage to stored spermatozoa begins. As the time and temperature increase recovery is prolonged. It has been shown that it takes approximately 60 days for a sperm cell to be produced and ejaculated. If a stallion has been ill for a prolonged period of time with sufficient temperature elevation in the testes, the stallion could be infertile for 60 days after the testis temperature has returned to normal.

NOT EJACULATING

Sometimes a stallion will mount and go through all the motions of breeding yet not ejaculate. This may be due to overuse, a bad experience (kicked, mishandled while copulating) or the time of year. The stallion manager should be experienced and capable of knowing if ejaculation has taken place. Some indications of ejaculation include flagging of the tail and a cessation of aggressiveness. Also, pulsations can be felt on the base of the stallion's penis. If a stallion is a gel producer there may be gel adhering to the end of the penis after dismounting. If a stallion has not ejaculated he will probably maintain interest in the mare after dismounting.

STALLION MANAGEMENT

Stallions are like any other class of livestock where the male can be managed effectively or ineffectively. Stallions require a balanced ration and free access to clean fresh water. It is best to have the stallion enter the breeding season in excellent condition, as some stallions will lose some weight and condition. Stallions may be maintained individually in open front sheds with 15 x 6 metre runs in front. Most stallions exercise themselves thus reducing labor.

Stallions should be trained to handle the breeding process mannerly. The stallion should approach the mare slightly to the left and from the rear, obtain an erection but not mount until the stallion handler allows him to. Once the stallion has mounted, he should be taught to remain mounted until he ejaculates and loses his erection. If stallions are handled in a routine manner each breeding, and the handler maintains discipline, there will be few problems.

Individual stallions may vary, but most mature stallions can be used twice a day. It is advisable to use the stallion early in the morning and late in the evening when using him twice in one day. The stallion should be rested whenever possible to reduce the possibility of overuse.

BREEDING AGES

Horses reach puberty between 12 to 18 months of age. It is therefore advisable to keep the stallions and fillies separate once they have reached a year of age. Even though young horses can reproduce, it is not advisable to have them do so. Mares should be handled and performance tested prior to going into the broodmare band. This gives the owner an opportunity to assess if the mare is worth breeding and also increases the value of her foals if she performs well. Mares that are bred to foal prior to maturity will require extra care and nutrition, especially during the period of lactation and last three months of pregnancy, so that she and her foal will grow to their genetic potential.

A stallion should be test mated to five or six mares when he is two or three years of age, then put into training and performance testing for a couple of years. This gives the owner the opportunity to evaluate his performance potential. Also, it allows for the test bred mares' foals to be born and give the owner an opportunity to evaluate the stallion's potential as a sire. Just because a mare or stallion can reproduce does not mean they should be allowed to. Think of advancement of the breed and not merely of obtaining a foal.

BREEDING PRACTICES

BREEDING SEASON

The normal breeding season for horses is from mid April to the end of August. Breeding prior to mid April wastes time and resources when success is limited.

Many breeders believe that early foals are bigger and stronger and thus earn more money and win more races at the track. Results from the race track do not support this concept. Early foals look good as yearlings but show little difference in race performance as two year olds or in a lifetime. Early foaling can be advantageous for producers selling weanlings or yearlings early in the year.

It is possible to induce mares to cycle early with the use of artifical lighting. The use of a 200 watt incandescent bulb in each box stall, or fluorescent lights to produce 400 candle power (four foot candles) at eye level will serve as sufficient stimulus. The lighting procedure can be handled three ways, starting between November 1 and November 15. Start by exposing mares to 11 hours of light per day and increase by 15 minutes per week until 16 hours of light exposure is obtained (Table 2). A more practical method is to use a fixed 16 hours of light exposure and 8 hours of darkness. This saves adjusting time clocks and mares respond similar to the adjusted times. The third means of light stimulation is to expose mares to two hours of light eight hours after dusk. By using lights it is possible to have most mares cycling normally in February. The use of supplemental lighting is a good management tool but for a lighting regime to work, the mare requires a minimum dark time daily and must have been through a period of time in which daily light exposure has been getting shorter.

Table 2 — Artificial Lighting Schedule

	a.m.		p.m.	
Date	Lights on	Lights off	Lights on	Lights off
November 1	7:00	8:30	3:30	6:00
November 8	6:45	8:30	3:30	6:00
November 15	6:45	8:30	3:30	6:15
November 22	6:30	8:30	3:30	6:15
November 29	6:30	8:30	3:30	6:30
December 6	6:15	8:30	3:30	6:30
December 13	6:15	8:30	3:30	6:45
December 20	6:00	8:30	3:30	6:45
December 27	6:00	8:30	3:30	7:00
January 3	5:45	8:30	3:30	7:00
January 10	5:45	8:30	3:30	7:15
January 17	5:30	8:30	3:30	7:15
January 24	5:30	8:30	3:00	7:30
January 31	5:30	8:30	3:30	7:45
February 7	5:30	8:30	3:00	8:00
February 14	5:30	8:30	3:30	8:15
February 20	5:30	8:30	3:30	8:30

ESTRUS DETECTION

The estrual signs are tail raising, eversion of the labial vagina (winking), squatting and urinating. Diestrual signs are ears back, kicking, squealing and a general aggressiveness. The day in which ovulation takes place is the day that most mares exhibit the maximum estrual signs and the minimal diestrual signs. It is important that the person detecting estrus becomes familiar with each mare's teasing reactions and judge her as an individual.

Teasing is the technique of exposing mares to stallions to determine the stage of estrous cycle. Mares should be teased daily with a stallion to determine estrus. If a mare does not respond to teasing on the first day of apparent diestrus the mare should be teased with a second stallion to be sure that the mare is not in heat. This is important as ovulation is associated with termination of estrus.

There are a number of ways in which mares can be exposed to a teaser stallion for heat checks. Each method has some definite advantages and disadvantages. In every case take a pencil and paper with you and write down the names or number of the mares in estrus.

Pen Teasing

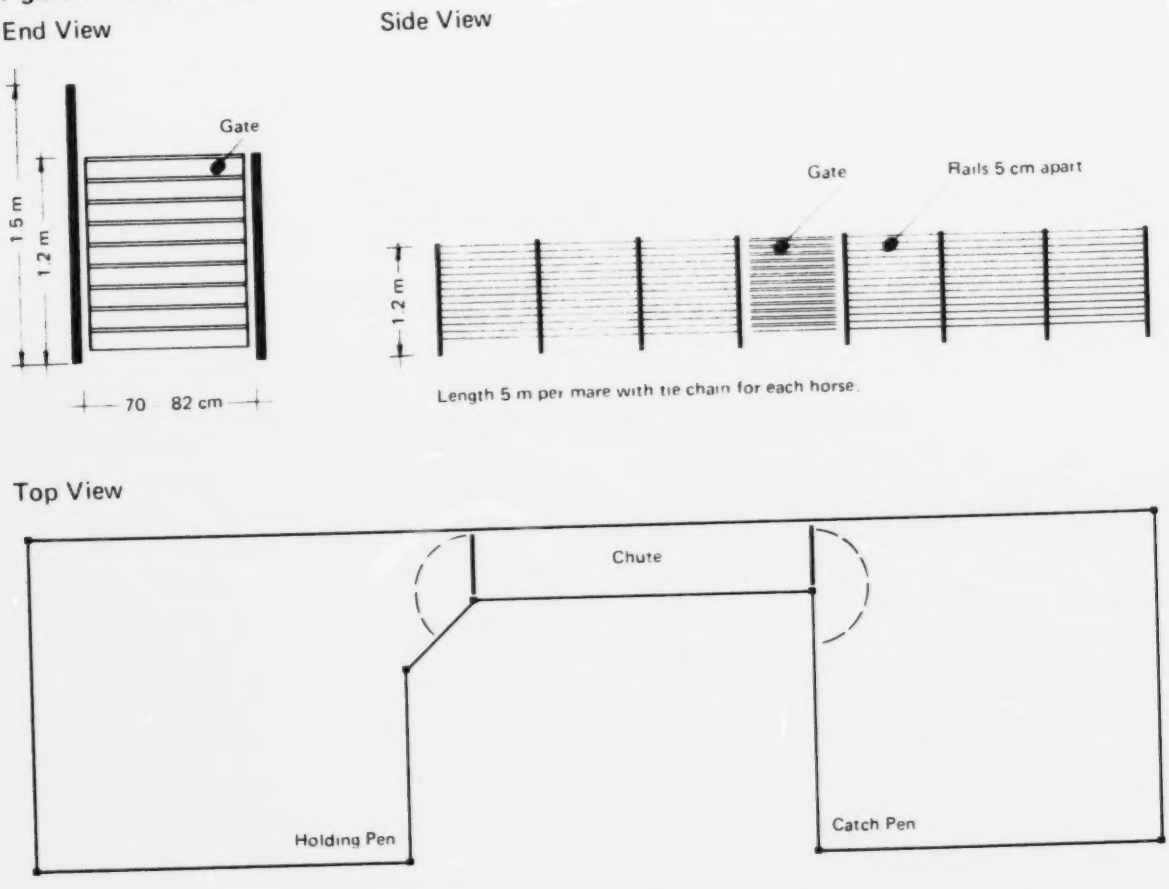
With pen teasing the mares are maintained in individual pens, and the stallion is brought to each mare. The method works well for both mares with foals and dry mares. Efficient use of labor is possible as mares do not have to be caught; also injuries to mares and foals are minimized. When checking mares with foals it is best to have a second person to hold the foal away from the mare so that it does not get injured. This method does require more facilities than some other methods but is one of the better methods for most stallion owners.

Teasing Chute - (Figure 7)

A tease chute is a wooden alley 70 - 82 cm wide, 1.5 metres high on one side and 1.2 metres on the other. The length of the chute can vary. Allow 5 metres per mare,

thus if the chute was to accommodate nine mares, it would be 45 metres long. Have a gate at each end and one or two in the side. Mares are placed in the chute and tied at 5 metre intervals. A stallion is led to the low side of the chute and allowed to tease each mare individually to determine the stage of estrus. It is important not to allow the stallion to savage mares when teasing in this method as mares will become refractive and not show heat. This method is only good for dry mares handled as a band. Estrual mares can be separated from diestrual mares via side gates of the chute. One stallion handler can tease many mares in a short time using a tease chute.

Figure 7 **Tease Chute**



Teasing Cage or Pen

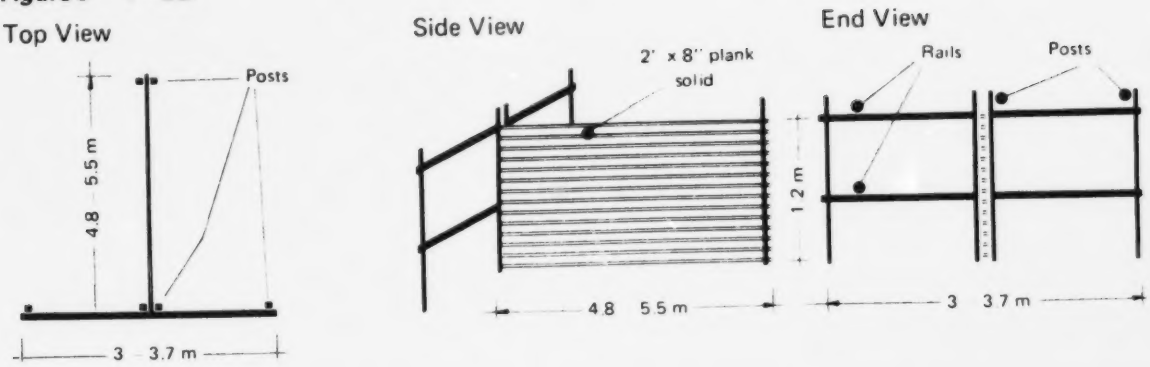
This method of heat detection has a stallion maintained in a cage or pen in the centre of a larger pen. The mares are allowed into the larger pen. Most estrual mares will go to the stallion cage and exhibit the signs of estrus. The moment a mare has demonstrated that she is in estrus, remove her from the group so the stallion can concentrate on other mares. It is advisable to lead each mare that does not show signs of estrus up to the stallion once the easy showing mares are removed, as some shy or timid mares will not exhibit signs unless actively teased. This method can be used for both mares with foals and dry mares. The main advantage is that little labor is required and mares can be maintained as a band. Probably the greatest drawback of this method is the personnel handling the mares in this manner often become lazy and do not see that each mare is actively teased.

T-bar - (Figure 8)

This method involves leading the stallion to one side of a rail and the mare to the other. The stallion is allowed to tease the mare over the rail. This method requires two people and requires considerable time. The method is a very effective means of detecting heat as each mare is individually teased. The method is very safe for the mare, stallion and the handlers; thus for most small breeders is ideal.

For mares with foals at foot, it is advisable to remove the mare from the pen or box stall, leaving the foal behind if the pen is safe, and take her to a tease bar for estrus detection. In approximately one week, the mare and foal will have adjusted to temporary separation and the mare will then tease better than in the presence of her foal.

Figure 8 T - Bar



Stallion Pen

If the stallion's pen is made of heavy material, the chances of injury are minimized, and it is possible to lead mares to the stallion pen to be teased. For mares with foals, have an additional person hold the foal approximately 2 metres in front of the mare being teased as this avoids the chance of injury to the foal, or leave the foal in a safe pen and take the mare to be teased.

Regardless of the method by which heat checks are made it is one of the most important facets of a breeding operation. *Remember if you cannot determine whether a mare is in estrus or not, then you have no breeding program.*

Once the heat checks are done take the slip of paper which has all mares marked on it and transfer the information to a wall chart. The design of the wall chart has the mares listed down the left side and the date along the top thus leaving open blocks for each mare for every day of the breeding season. The advantage of this chart is that all the heat checks and breeding dates are on one chart and easy to see and study. A suggested way of marking the chart is to use a "C" for cold days; an "H" for hot days and a "B" above the "H" if the mare was bred on a given day. You may devise your own method of marking the chart but keep it simple; this will make it easy to work with and an excellent management tool. (Figure 9)

Figure 9

APRIL ⇨ JULY

MARE	13	14	15	16	17	18		7	8	9	10	11	12
A	C	H	H	H	H	H		C	PREGNANT				
B	C	H	C	H	C	C		C	C	C	C	C	C
C	H	H	H	H	H	H		BH	C	C	C	C	C
D	C	C	C	C	C	C		PREGNANT					
E	C	C	H	BH	H	BH		C	PREGNANT				
F	C	C	C	C	C	H		C	C	C	H	BH	H

Breeding chart

BREEDING TIMES

Mares may ovulate at any time during estrus but as a general rule a mare will ovulate 24 to 48 hours before the end of estrus. For maximum conception, breeding within 12 hours of ovulation is ideal. Since the life of the ovum and sperm in the reproductive tract is over 24 hours, breeding mares every other day of heat beginning on day 2 or 3 of estrus is recommended.

Ovulation time can be estimated by rectal palpation which is of value during the early part of the breeding season or when more mares are in heat than can be serviced on a given day. For best results the veterinarian needs to examine the mare daily and determine changes in ovarian activities.

PREPARATION OF MARES

Preparation of a mare for breeding is essential. Once the mare has been determined to be in estrus, she should be hobbled with breeding hobbles, and the tail wrapped. The tail can be wrapped with a tube sock by pulling it over the tail and taping it to the base of the tail. The external genitalia and buttocks should be washed with soap and water then rinsed with a tamed iodine solution. Prior to being mounted, in addition to being hobbled, the mare should be twitched as a means of restraint. This will help prevent the stallion from being kicked, and injured.

PREPARATION OF THE STALLION

The stallion should be brought from his pen to a "T" bar or tease rail and allowed to tease an estrual mare until he obtains an erection. A second person should then wash the stallion's penis with soap and warm water (38°C). Clean the urethral diverticulum and the prepuce area very well as these two areas tend to collect filth more readily than the shaft of the penis. Then rinse the penis with warm (38°C), clean water making sure all soap is removed. Recent studies have shown excessive washing and/or the use of aseptic soaps to cleanse the penis prior to breeding may actually increase the incidence of reproductive pathogens.

BREEDING PROCEDURE

It is advisable to handle the stallion with a lead shank on which a chain is fastened to the halter and passed through the mouth or use a breeding bridle. A routine procedure of washing the stallion and going to a designated breeding area will serve as stimuli for breeding. The breeding process should involve three people, a mare holder, a stallion handler and a person to guide the stallion's penis.

The stallion should approach the restrained mare slightly to the left and from the rear. He should be allowed to nuzzle the mare and then mount from the rear. The stallion handler should not allow the stallion to mount before he has an erection. Once the stallion mounts, the third person should guide the stallion's penis into the mare's vagina to avoid contamination or injury and then make sure the stallion has ejaculated. Once the stallion has ejaculated, he will lose his erection and dismount. Turn the mare so that she is facing the stallion after he dismounts to avoid the possibility of kicking, causing injury to mare, stallion or handlers. The stallion's penis should be rinsed to help prevent infection.

While breeding, stallions should not be allowed to bite mares. Muzzle the stallion if necessary. When handling the stallion be sure that he is always under control. It may be necessary to carry a whip. Do not allow the stallion to develop unruly tactics.

The stallion handler should take some precautions against injury by the stallion. When leading the stallion stand just in front and to the outside of the shoulder and maintain contact on the lead shank. It is advisable to wear a hard hat and hard toed shoes for safety reasons. This is especially true for the person collecting semen from a stallion.

ARTIFICIAL INSEMINATION

Artificial insemination (AI) in horses involves collecting semen from a stallion with an artificial vagina (AV), dividing the semen into fractions containing a minimum of 100×10^9 to a maximum of 500×10^9 motile sperm cells and depositing the required allotment of semen into the uterus of each mare in heat.

Stallion semen is collected by inserting his penis into an AV while mounting an estrual mare (as in natural breeding) or on a phantom. The artificial vagina has a lubricated rubber lining surrounded by warmed water (48°C). At the end of the rubber lining the semen is collected in a collection bottle containing a filter that separates the gel fraction of the ejaculate.

After collection the semen is maintained at body temperature (38°C) while the insemination volume is determined, and the mares are inseminated.

Prior to collection of the stallion, the mares to be inseminated are tied in a breeding chute and the tails wrapped and tied up out of the way. The external genitalia and the buttocks are washed with warm water and soap, then rinsed with a tamed iodine solution.

The volume of semen necessary for the 100×10^9 - 500×10^9 motile sperm cells is drawn into a warm (38°C) sterilized catheter. The catheter is carried into the vagina by the inseminator wearing a sterilized sleeve and then passed through the cervix into the uterus where the semen is deposited.

The management of the stallion for maximum reproductive efficiency, is only possible when using AI. From a practical point there is no difference in total numbers of sperm collected per week when stallions are ejaculated every other day or every day. Therefore in an AI management system the stallion is put on an every other day collection schedule. Once mares are cycling normally and AI is being used, it is not necessary to determine time of ovulation in mares as few stallions are booked too heavily

to produce insufficient sperm to inseminate all mares in heat on a given day. For maximum conception rate and efficient labor usage mares should be inseminated every other day during estrus beginning on day 2 or 3 of estrus. This coincides with every other day semen collections.

Preparation of the stallion to collect semen is the same as natural service, however, it is not necessary to rinse the stallion's penis after collection. The collection mare will be prepared as for natural service.

Under proper management, AI allows for more mares to be bred with better conception rates than under natural service.

PASTURE BREEDING

Pasture breeding consists of maintaining the stallion together with all mares to be bred mares during the breeding season. The advantages of this method of management are that little or no labor is required and heat detections are not required.

Stallions and mares in a closed herd readily adapt to a pasture breeding system although the number of mares that can be effectively serviced is low, usually less than 20. A major disadvantage is that venereal disease can be spread through the entire herd including the stallion. This risk is especially high when outside mares of unknown health status are put in the herd. Also, problems of mares not conceiving may not be noticed soon enough. The risk of valuable stallions and mares becoming injured is considerably higher than with hand breeding. Some stallions may not accept new mares to the band after breeding season starts. Stallion overuse is a possibility since one-third of the non-pregnant mares are in estrus at one time during the breeding season. This can be further aggravated if the stallion happens to be immature or has small testes resulting in low sperm output. Because the mare is bred at random by the stallion and the farm manager does not know when mares are in estrus, potential foaling dates are not available.

Pasture breeding is not recommended under most conditions although in some management schemes where very few mares in a closed herd are to be bred and labor is a problem, it may be practical.

MISCELLANEOUS

FACILITIES

A complete discussion of facilities is available in a separate bulletin called Horse Handling Facilities.

BREEDING AREA

The area where the stallion breeds a mare or where semen is collected should be covered. If indoor facilities are not available a designated area for breeding should be made available. The area should be at least 15 metres x 15 metres and free of any obstructions. There should be good footing at all times. A possible outside ground cover would be 10 to 15 cm of pea size gravel.

If inside facilities are available the same area is required. The ceiling should be 3.7 metres. The footing could be packed clay covered with 5 cm of sand. It may be necessary to water or lightly oil the sand to prevent dust. Pea size gravel could also be used.

HANDLING OUTSIDE MARES

The mare owner should bring the mare to the stud farm approximately 2 weeks prior to the anticipated date of commencing breeding, and should be prepared to leave her there until she is diagnosed pregnant. The mare then becomes the responsibility of the stallion handler upon arrival at the premises. The stallion handler should care for and handle the mare to give her the greatest opportunity to become pregnant.

On well managed farms where mares on the average take less than 1.5 cycles to become pregnant, the time mares will spend at the breeding farm to be diagnosed pregnant is 70 plus days.

All incoming mares should be accompanied by a health certificate from a veterinarian along with a record of immunization shots, wormings, and a copy of her registration papers. Mares with signs of disease or incomplete health records should be refused or kept in isolation for about two weeks.

Ideally, it would be nice to handle all incoming mares individually (separate pens, etc) but under many management schemes this is not possible or practical. Broodmares can be handled as groups but care should be taken to ensure that all mares are getting a balanced diet and not injured. The mare owner should be prepared to pay extra if he requests an individual pen.

Mares with foals can be maintained in individual pens. This prevents foals becoming injured and also facilitates heat detection.

On many breeding farms, the mares that are handled in small groups are more content and become pregnant sooner than individually housed mares.

The mare owner should be prepared to pay board and veterinary fees for the time his mare is at the stud.

BREEDING CONTRACTS

To avoid misunderstanding, all mare owners should be required to sign a contract along with the stallion owner. Some of the information that should be included in the contract are the mare owner's name, address and phone number, the mare's name and registration number, the breeding fee and payment dates and extra costs such as daily mare board and veterinary fees.

There should be some statements as to what is required of the mare when she comes to the stallion (Coggin's test, bill of health, vaccinations, registration papers). The contract should spell out what the stallion owner is responsible for, what guarantee is provided and of course the stallion the mare is being bred to. All costs should be designated (board, service fee and booking fees). Veterinary and farrier fees should be stated as the responsibility of the mare owner. This should be signed by both the mare owner and stallion owner with a copy of the contract to go to each party.

The following is a sample breeding contract:

BREEDING CONTRACT

This agreement made this ____ day of _____ 19__;
by and between _____ of _____,
hereinafter referred to as "Mare Owner", and _____
_____ of _____ hereinafter referred to as "Stallion Owner".

1) The stallion owner does hereby reserve for the mare owner one season's booking in 19____ to the stallion _____, reg. no. _____ for breeding of mare _____, reg. no. _____.

2) The mare owner shall pay the stallion owner a stallion service fee of $ _____ of which $ _____ must be paid as nonrefundable (except for item 4 below) booking fee upon the signing of this contract. The balance of the service fee and other expenses as indicated below shall be paid by the mare owner prior to removing the mare from the stallion owner's premises.

3) The mare owner shall provide the stallion owner with a copy of the mare's registration papers, a negative Coggin's Test certificate issued within a month of mare arriving at stallion owner's premises, and a veterinarian's health certificate (within one month) indicating that the mare is reproductively sound, free of communicable diseases, has been dewormed and has been vaccinated against equine influenza.

4) The stallion owner reserves the right to refuse said mare if she fails to meet acceptable quality and/or health standards.

5) The mare owner shall pay the stallion owner $_____ per day for care of dry mares and/or $_____ per day for mares with foals. The mare owner shall pay all veterinary and farrier costs charged toward the mare. Pregnancy diagnosis expenses shall be paid by the stallion owner.

6) The stallion owner shall manage said mare and stallion in a proper manner for maintaining normal health and breeding performance.

7) Mare owner is entitled to return said mare for breeding as often as necessary during the current breeding season (breeding season is defined as the months between March 1 and Sept. 1). Should conception not occur after consecutive breedings during one breeding season, or should said mare prove to be barren after 40 days and before 90 days post breeding as evidenced by the certificate from a qualified veterinarian, stallion owner shall have earned the booking fee and all expenses but not the balance of the service fee and shall have no further obligations to the mare owner.

   The stallion owner requests that mares remain at the stud farm at least 40 days post breeding to facilitate pregnancy diagnosis.

8) The stallion owner shall have earned the entire service fee upon receipt of a veterinary certificate indicating said mare is pregnant. The stallion owner shall sign the breeders certificate and/or application for registration for a foal resulting from this breeding.

9) This contract is not transferable unless agreed to in writing by both stallion owner and mare owner.

10) The stallion owner is not responsible for accidents, injuries and/or death of any horse at the stud farm unless directly due to negligence. In the event of an emergency, the mare owner will be contacted. If the mare owner cannot be contacted, the stallion owner is authorized to contact _____ D.V.M., or failing him any veterinarian.

11) I hereby agree to the conditions outlined in this contract

_____	_____
MARE OWNER	STALLION OWNER
Phone _____	Phone _____

DEFINITIONS

Colostrum	-	mares first milk—high in nutrients and antibodies
Diestrus	-	not in heat
Ejaculate	-	expulsion of semen from the stallion
Embryo or Fetus	-	terms to describe a stage of development of the unborn foal
Estrus	-	in heat
Fertilization	-	union of sperm and ovum
Genital	-	to do with the reproductive organs
Gestation	-	pregnancy period or time from breeding to foaling about 340 days
Ovum	-	egg - female gamete, carries units or heredity of the mare
Semen	-	sperm plus fluid of the ejaculate
Sperm	-	male gamete, carries the units of heredity of the stallion
Parturition	-	foaling
Placenta	-	membranes surrounding the fetus in the uterus, afterbirth
Umbilical Cord	-	blood vessels between the fetus and placenta

SERVICES AVAILABLE

Further information and assistance can be obtained from your local veterinarian or the

Horse Industry Branch, Alberta Agriculture,
Room 205, 2003 McKnight Blvd. N.E.,
Calgary,
Alberta T2E 6L2 (Phone: 291-4596)

or

#905 O.S. Longman Bldg.,
6909 - 116 St.,
Edmonton,
Alberta T6H 4P2 (Phone 427-8905).

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